

is then moved to such a position that the observer's eye sees three points in a straight line, viz., the eye of the rod, the centre of the mirror, and the reflected image of a selected point of the cloud. The direction of the displacement which the latter undergoes after a time, proportional to the velocity of the cloud and inversely as its distance, is the required direction.

THE Report of the Royal Society of Tasmania for 1878 includes the tri-daily meteorological observations made at Hobart Town by Mr. Francis Abbott, so long an enthusiastic observer there, together with the annual abstract of his observations, and also an annual abstract of observations made by Mr. W. E. Shoobridge at New Norfolk, situated about fifteen miles from Hobart Town, higher up the Derwent. Observations were formerly made at Port Arthur, Swansea, Swan Island, and Kent's Group, viz., from 1861 to 1866, but at present Hobart Town and New Norfolk appear to be the only meteorological stations in the colony, the observations at Hobart Town dating from 1841, and those at New Norfolk from 1874. Mr. Abbott prints also his daily observations made at 10.33 P.M. in connection with Gen. Myer's international synchronous observations, the importance of which we have several times had occasion to refer to in describing the United States weather maps. The regular hours of observation are 7.30 A.M. and 4.30 P.M., these hours having been adopted since 1876, as stated in the Report, with the view of assimilating the records more closely with those of stations in Europe, America, &c., in order to co-operate in a system of international meteorology. These hours have not been happily chosen for general meteorological purposes, particularly since it is the practice to adopt as the mean temperatures of the separate months simply the mean of the observations at the above hours, which, whilst only very slightly below the true mean during the winter months, are from  $1^{\circ}5$  to  $2^{\circ}8$  too high for the four warmest months of the year.

#### PHYSICAL NOTES

AT the last meeting of the Physical Society of Paris some new and curious experiments upon the so-called magic mirrors of Japan were shown by M. Duboscq and discussed upon by M. Bertin. Mirrors having a sufficiently true surface to give a fairly good virtual image of an object held near to them may yet be very irregular in the actual curvature of the surface and produce a very irregular real image of a luminous point reflected by the mirror upon a screen. If such a mirror be warmed the thinner portions change their curvature, becoming flatter, and yield dark corresponding patches in the disk of reflected light. A mirror which gives very imperfect effects when cold will give very good ones when heated. If, by means of a condensing pump, a uniform pressure is exerted against the back of the mirror, the thinner portions are more affected than the thick portions, and therefore, as viewed from the front, become less concave than the rest of the surface, the result upon the reflected beam being that the pattern of the thicker parts comes out bright on the darker ground of the image. Lastly, if a mirror be cast upon the face of the original mirror, and then polished, it will when warmed become a "magic" mirror, though when cold it yields only a uniformly illuminated disk upon the screen. This last experiment alone suffices to show that the cause of the reputed magical property is to be sought not in any difference of reflective power in different parts of the surface, but in slight differences of curvature of the surface.

A NEW zinc-carbon battery, the patent of Mr. R. Anderson, is announced. The exciting liquid is a mixture of hydrochloric acid, bichromate of potash, and of certain other "salts" in a mixture, for the composition of which Mr. Anderson claims the protection of the patent. The battery may be used either with or without a porous cell. It is stated that the E.M.F. of this battery is as high as  $2^{\circ}15$  volts, that it is remarkably free from local action and internal resistance, and that it is very constant, one cell having twelve square inches of effective surface of the zinc, giving for seventy hours a constant current.

MR. A. A. MICHELSON, of the U.S. Navy, has communicated to the New York Academy of Sciences some interesting observations upon the diffraction and polarisation effects produced by passing light through a narrow slit. If a fine adjustable slit be narrowed down very greatly, the coloured diffraction fringes widen out until when the width of the slit is reduced to less than one-fiftieth of a millimetre, the central space only is seen, and appears of a faint bluish tint. Moreover, the

light so transmitted exhibits traces of polarisation when regarded through a Nicol prism. If the slit is still further narrowed, the depth of the tint and the amount of polarisation increase, until, when a width of only one-thousandth of a millimetre is reached, the colour becomes a deep violet and is perfectly polarised. In this experiment the Nicol prism may be used either as polariser or as analyser. Slits of iron, brass, and obsidian produce identical results, though with the latter material, which can probably be more finely worked, the effects are the most pronounced. The polarisation is in a plane at right angles to the length of the slit. The phenomenon is best observed by using direct sunlight, placing the slit as near the eye as possible, and analysing with a double-image prism, thus enabling the delicate changes of tint to be observed by comparison. The possible explanation that the light which thus comes through the slit is reflected at its edges accords with the direction of the plane of polarisation; but there remains the difficulty that these effects should take place with all widths of slit and vary with the nature of the materials. One important point is that a slit of this degree of fineness admits the shorter waves of light more freely than the longer waves.

LORD RAYLEIGH showed a curious experiment in colour-combinations to the Physical Society, when he produced a yellow liquid by mixing a blue solution of litmus with a red solution of bichromate of potash. We recollect a kindred experiment which is even more curious, namely, the production of white by the mixture of crimson and green. An aqueous solution of cuprous chloride and a solution of rosaniline acetate in amylic alcohol are placed in a bottle in certain relative quantities. The crimson solution floats upon the green solution. But when shaken up together both colours disappear, and the mixture is simply a turbid greyish white.

MR. PREECE's new microphone or telephone transmitter has at least the merit that it surpasses all others for simplicity. A very thin wire stretched between two points forms part of a circuit containing a Bell telephone and a small battery. When it is set vibrating by sounds, the vibrations, by varying the strain to which it is subjected, alter its conductivity, probably by producing alterations in its temperature.

M. OBALSKI describes a pretty magnetic curiosity to the Académie des Sciences. Two magnetic needles are hung vertically by fine threads, their unlike poles being opposite one another. Below them is a vessel containing water, its surface not quite touching the needles. They are hung so far apart as not to move towards one another. The level of the water is now quietly raised by letting a further quantity flow in from below. As soon as the water covers the lower ends of the needles they begin to approach one another, and when they are nearly immersed they rush together. The effect appears to be due to the fact that when the gravitation force downwards is partly counteracted by the upward hydrostatic force due to immersion, the magnetic force, being relatively greater, is able to assert itself.

THE phenomenon of luminosity of a (especially) negative electrode of small surface used in electrolysis of, e.g., acidulated water, has been investigated by Prof. Colley of Kasan (*Four. de Phys.*, May). Examining the light (which Slouguinoff found associated with an intermittence of the current) with a rotating mirror, he saw on a weakly luminous ground a multitude of bright star-like points, each appearing only an instant, and distributed without apparent regularity. The spectrum of the negative electrode was found to be composed of bright lines, determined both by the liquid and the substance of the electrode. Some physicists have thought that the electrode is considerably heated, and that the liquid round it assumes the spheroidal state, being separated by a layer of vapour. M. Colley finds that with a very strong current the electrode indeed becomes incandescent, and the liquid ceases to moisten it. He shows, however, that the illumination may be produced on an electrode quite cold, and he seeks the cause of production of vapour (of which he supposes the isolating layer to consist) in the high temperature of the liquid immediately surrounding the electrode (not in that of the electrode itself), heat being developed by reason of the small surface and small conductivity of a thin sheath of liquid. With a pile of 100 Bunsen couples, water containing 5 per cent. of sulphuric acid, and an electrode of 10 sq. mm. surface,  $1^{\circ}3$  seconds would suffice to raise the layer next the electrode from  $20^{\circ}$  to  $100^{\circ}$  C. The sheath of gas

formed round the electrode may serve as germ for formation of a layer of vapours, and this being once formed, the discharges occur by sparks.

#### GEOGRAPHICAL NOTES

WE are delighted to find that our good neighbours, the French, will not be behind the rest of the scientific world in exploring the depths of the sea. A large Government steamer, the *Travailleur*, will be at Bayonne on the 15th of next month to undertake a dredging expedition along the Atlantic coasts of Spain, under the charge of Prof. Milne-Edwards and the Marquis de Folin. Dr. Gwyn Jeffreys and the Rev. Mr. Norman have been officially invited to take part in this expedition. The Dutch are also making arrangements for a dredging expedition in the West Indies.

FROM a note in the June number of the *American Naturalist* it seems extremely likely that the U.S. Senate will endorse the approval given to the Howgate Polar Expedition by the House of Representatives. The steamer *Gulnare*, 230 tons burthen, is being fitted up, and will have a crew of fifteen officers and men. The observing party, which will be left at the station as near Lady Franklin Bay as possible, will consist of twenty-five men, including the necessary scientific corps. A house of wood is being fitted up for the men to winter in on the shores of Discovery Bay, and a steam launch will form part of the expedition. "In making this report the committee respectfully state and report that the object of the bill, as is shown by its terms, is to authorise a temporary station to be selected within the Arctic circle, for the purpose of making scientific discoveries, explorations, and observations, obtaining all possible facts and knowledge in relation to the magnetic currents of the earth, the influence of ice-floes therefrom upon the winds and seasons, and upon the currents of the ocean, as well as other matters incidental thereto, developing and discovering at the same time other and new whale-fisheries, now so material in many respects to this country. It is, again, the object of this bill that this expedition, having such scientific observations in view, shall be regularly made for a series of years under such restrictions of military discipline as will insure regularity and accuracy, and give the fullest possible return for the necessary expenditure; and again, in view of the fact that either the governments directly, or scientific corps under their authority, of Germany, Holland, Norway, Sweden, Austria, Denmark, and Russia, have concurrently agreed to establish similar stations, with like object, during the year 1880, it is believed that the interests and policy of our people concur in demanding that the United States should co-operate in the grand efforts to be thus made in the solution of the mysteries and secrets of the North Polar seas, upon which, in the opinion of scientists, depends so much that affects the health and wealth of the human race." This station will form one of the series of International Arctic Observatories to which we have already referred.

DURING the past year H.M.S. *Alert*, first under Sir G. S. Nares, and afterwards under Capt. Maclear, was engaged in very useful service on the west coast of South America, chiefly in examining the channels in about 50° S. lat. Trinidad Channel, which opens out a clear passage to the Pacific 160 miles north of Magellan Strait, has been carefully surveyed, together with its various ports and anchorages. This channel forms a valuable addition to our knowledge of these waters, as it will enable vessels bound westward to avoid the heavy sea often met with in the higher south latitude. Its southern shores are bounded by bold rugged mountains rising abruptly from the sea, and on the north side a low wooded country lies between the sea and the snow-clad mountains in the distance. The *Alert* also visited St. Felix and St. Ambrose Islands, which, owing to the depth of the soundings obtained, are thought to be unconnected with both the South American continent and the San Juan Fernandez group. Capt. Maclear describes St. Ambrose Island as volcanic, composed of lava in horizontal strata, intersected vertically by masses of basalt. Vegetation is scant, and the island is without water; though frequented by sea-birds, its sides are too steep and rugged for guano to collect. From the soundings it would seem that this, as well as the other islands, rises as an isolated mountain from a submarine plateau.

AT the meeting of the Paris Geographical Society of May 7 a Greek physician, Dr. Panagiotés Potagos, was introduced by MM. Ujfalvy and Duveyrier as one of the most extensive tra-

ellers of our time. M. Potagos, we are told, has since 1867, beginning at Tripoli in Asia Minor, visited Teheran, skirted the Paropamisus on his way to Medjid, Herat, Kandahar and Kabul; crossed the Hindu Kush by one of the most difficult passes, traversed Badakshan, Wakhan, and all Kashgaria, arriving at Hami in 1871. Thence he went to Ulussutai in the heart of Mongolia, returning to Hami, where all his notes and collections were destroyed, and he himself kept prisoner for more than a year. Thence continuing his journey, he reached Kulja, and returned to Europe by Semipalatinsk, Omsk, Moscow, and St. Petersburg. After staying at Salonica for two years, he went to Bombay and Peshawur, descended the Indus to Karachi, thence to Bunder-Abbas in Persia, crossed the mountains of Laristan, and made his way to Kabul, reaching India again by the Kurram Valley, meeting Major Cavignari on his way. From Bombay he went to East Africa, and penetrated into the interior farther than Schweinfurth. The principal sphere of his African journeys seems to have been in the region of the River Beré, which M. Duveyrier is of opinion is the Wellé of Schweinfurth, but which, according to M. Potagos, cannot be connected with the Aruwimi of Stanley, but rather with the basin of the Shari. The observations of M. Potagos are, however, too vague to be of much scientific value, unless, indeed, further details be forthcoming.

MR. LAURENCE OLIPHANT has lately returned to England from a journey of exploration on the eastern side of the River Jordan, and is, we believe, engaged in preparing for publication an account of the results of his investigations.

THE map of Equatorial Africa, on the scale of 15·8 miles to one inch, on which Mr. E. G. Ravenstein has for some time been engaged for the Geographical Society, is stated to be approaching completion, and it is expected that the lithographed sheets will be ready during the summer. An analytical catalogue of works on African travel and geography, including papers in periodicals, is being compiled at the same time.

MR. STANFORD has just published a fine new wall map of New Zealand, on the scale of seventeen miles to an inch. The whole of the coast line, together with the details of harbours and banks of these islands, has been carefully reduced from the most recent Admiralty Charts. The interior details of rivers and mountains, roads and railways, towns and villages, have been plotted in from the various Government surveys and partly from private sources. Although not over-crowded with names, it contains, besides the chief physical features, the names of all villages and other centres of population, together with the names of many places of interest, such as the geysers or hot springs and the boiling lakes of the North Island. The principal Maori tribal names are also given over the areas once occupied by them. The map is coloured to show the boundaries of the new administrative divisions, all of which are named. The large size, accuracy, and clearness of this map render it eminently useful for teaching purposes.

THE annual address of Chief Justice Daly, President of the American Geographical Society, on the Geographical Work of the World in 1878 and 1879, is as usual, remarkably comprehensive and well arranged; indeed it is the best summary of the subject we have seen.

*L'Exploration* of June 2 contains an interesting article on the various explorations of M. Paul Soleillet in Africa. There is also a map of the French possessions and factories on the coast of Guinea.

"ANGLO-CANADIAN" sends us the draught of a scheme for reaching the North Pole by balloon in comparatively few days, at a cost which must take the gas completely out of the elaborate and expensive scheme of Commander Cheyne. Our correspondent has patented a directable balloon, which he maintains is capable of being moved at a rapid rate in any direction. We need not enter into the details of his plan, which reads very glibly, but which we should like to see subjected to rigid scientific tests. The whole scheme is to cost only 2,000*l.*, including a steamer to be chartered to Spitzbergen to take the necessary compressed gas which "Anglo-Canadian" would use as fuel. We do not attach much importance to the attainment of the Pole, and shou'd prefer to see any money that can be raised for Arctic exploration in this country devoted to the founding of one of those international series of Arctic observations from which England is conspicuously absent.